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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Application Number: 10/666,019
Filing Date: September 17, 2003
Appellant(s): MEAGLEY ET AL.

Timothy N. Trop
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 9/6/2006 appealing from the Office action mailed

5/16/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct. It is noted by the examiner that the figure in the summary was not claimed, and was included purely to illustrate the claim.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,858,370   KODAMA et al.   5-2005

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 2, 5, 13-16, 18, and 23-28 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Kodama et al (6,858,370).

Kodama et al disclose a positive photoresist composition comprising an acid generator

meeting the instant claim limitations. Compounds of formula (II) in columns 13-16 appear to

meet the instant claim limitations. The structure in column 13 (lines 1-24) has three substituents,

which may all be an organic group not having an aromatic ring, preferably, 1-20 carbon alkyl

groups, 2-oxoalkyl,or alkoxycarbonylmethyl group. Each of these being a preferred group

would meet the instant claim limitations. Given this teaching, it would have been obvious to one

of ordinary skill in the art to prepare the material of the reference choosing each of the groups to

be a straight chain or branched 2-oxoalkyl group, alkoxycarbonyl, or 1-20 carbon alkyl group

with reasonable expectation of achieving a material having high etch resistance.

(10) Response to Argument

Appellant has argued that the reference fails to meet the instant claim limitations as the

compounds of the reference are not entirely sigma bonded and do not contain cyclic groups. As

discussed above, the generic formula in column 13 clearly teaches that all three substituents may

be groups other than cyclic groups. Specifically, the reference teaches that preferred substiutuent

groups also include (other than cyclic) 2-oxoalkyl groups, alkoxyccarbonyl groups, and alkyl

groups such as methyl, ethyl, propyl, butyl, and pentyl groups, all five of which are completely

sigma bonded. Inchemistry, sigma bonds describe bonding interactions involving an overlap of a

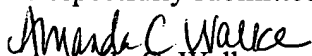single lobe of one orbital with a single lobe of another. For example, propane comprises ten

sigmas bonds, one each for the C-C bonds, and one each for the eight C-H bonds. No other types of bonds are present. To support this known chemical information, a passage discussing sigma bonding in alkanes from *Organic Chemistry(5th Edition) by Fessenden and Fessenden* has been included. Given that the reference *clearly* teaches that the sulfonium compound may be substituted ay all alkyl groups, which are *entirely* sigma bonded, the examiner maintains her position that the reference suggests to one of ordinary skill in the art to prepare a sulfonium acid generator having all non-cyclic sigma bonded moieties.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Amanda C. Walke

Conferees:

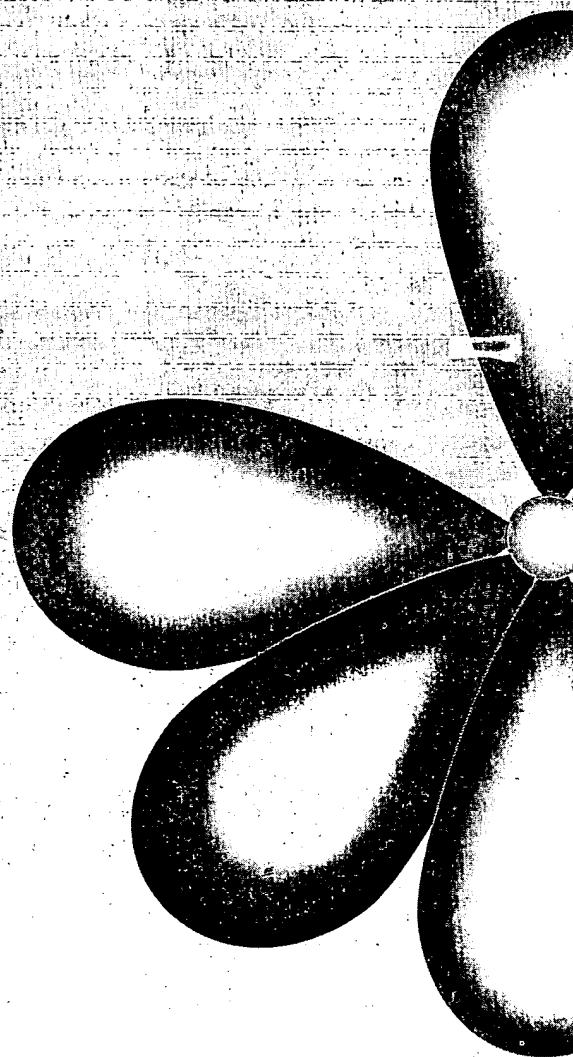Cynthia Kelly

Jennifer Kelly-Michener

ORGANIC CHEMISTRY

5th EDITION

Ralph J. Fessenden

University of Montana

Joan S. Fessenden

(the late)

Brooks/Cole Publishing Company
Pacific Grove, California

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Section 2.3
Some General Features of Bonding and Antibonding Orbitals

Let us summarize some general rules that apply to all molecular orbitals, not only the molecular orbitals of H_2:

1. Any orbital (molecular or atomic) can hold a maximum of two electrons, which must be of opposite spin.

2. The number of molecular orbitals equals the number of atomic orbitals that went into their formation. (For H_2, two $1s$ atomic orbitals yield two molecular orbitals: σ and σ^*.)

3. In the filling of molecular orbitals with electrons, the lowest-energy orbitals are filled first. If two orbitals are degenerate (of equal energies), each gets one electron before either is filled.

Section 2.4
Hybrid Orbitals of Carbon

When a hydrogen atom becomes part of a molecule, it uses its $1s$ atomic orbital for bonding. The situation with the carbon atom is somewhat different. Carbon has two electrons in the $1s$ orbital; consequently, the $1s$ orbital is a filled orbital that is not used for bonding. The four electrons at the *second energy level* of carbon are the bonding electrons.

There are four atomic orbitals at the second energy level: one $2s$ and three $2p$ orbitals. However, carbon does not use these four orbitals in their pure states for bonding. Instead, carbon blends, or **hybridizes**, its four second-level atomic orbitals in one of three different ways for bonding:
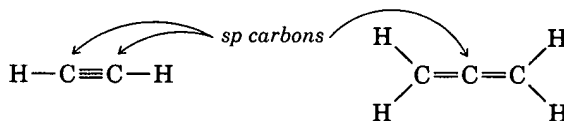
1. sp^3 **hybridization**, used when carbon forms four single bonds.
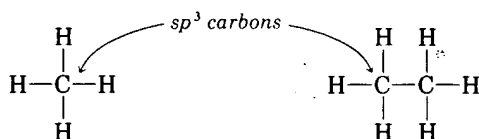
2. sp^2 **hybridization**, used when carbon forms one double bond.
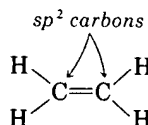
3. sp **hybridization**, used when carbon forms a triple bond or *cumulated* double bonds (two double bonds to a single carbon atom).

Why does a carbon atom form compounds with hybrid orbitals rather than with unhybridized atomic orbitals? The answer is that hybridization gives stronger bonds because of greater overlap and therefore results in more-stable, lower-energy molecules. As we discuss each type of hybridization, note that the *shape* of each hybrid orbital is favorable for maximum overlap with an orbital of another atom. Also note that the *geometries* of the three types of hybrid orbitals allow attached groups to be as far from each other as possible, thus minimizing their repulsions for each other.

A. sp^3 Hybridization

In methane (CH_4), the carbon atom has four equivalent bonds to hydrogen. Each C—H bond has a bond length of 1.09 Å and a bond dissociation energy of 104 kcal/mol. The bond angle between each C—H bond is 109.5°. From this experimental evidence alone, it is evident that carbon does not form bonds by means of one *s* atomic orbital and three *p* atomic orbitals. If that were the case, the four C—H bonds would not all be equivalent.

According to present-day theory, these four equivalent bonds arise from complete hybridization of the four atomic orbitals (one 2s orbital and three 2p orbitals) to yield four equivalent sp^3 orbitals. For this to be accomplished, one of the 2s electrons must be promoted to the empty 2p orbital. This promotion requires energy (about 96 kcal/mol), but this energy is more than regained by the concurrent formation of chemical bonds. The four sp^3 orbitals have equal energies—slightly higher than that of the 2s orbital, but slightly lower than that of the 2p orbitals. Each of the sp^3 orbitals contains one electron for bonding.
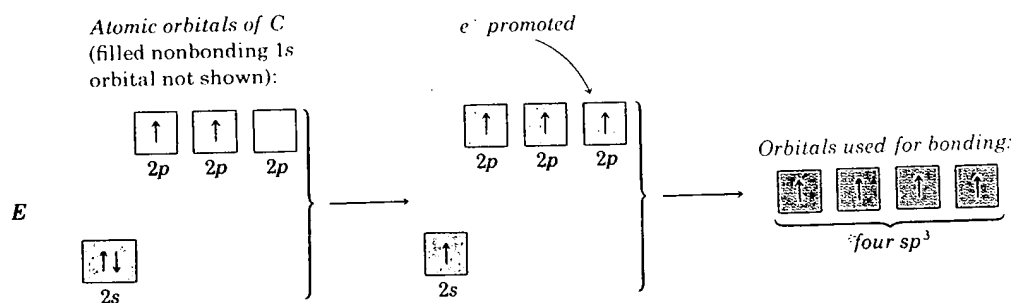
The preceding diagram is called an **orbital diagram**. Each box in the diagram represents an orbital. The relative energies of the various orbitals are signified by the vertical positions of the boxes within the diagram. Electrons are represented by arrows, and the direction of electron spin is indicated by the direction of the arrow.

The sp^3 orbital, which results from a blend of the 2s and 2p orbitals, is shaped rather like a bowling pin: it has a large lobe and a small lobe (of opposite amplitude) with a node near the nucleus. Figure 2.8 shows one isolated sp^3 orbital. The small lobe of the hybrid orbital is not used for bonding because overlap of the large lobe with another orbital gives more complete overlap and results in a stronger bond.

Four sp^3-hybrid orbitals surround the carbon nucleus. Because of repulsions between electrons in different orbitals, these sp^3 orbitals lie as far apart from each other as possible while still extending away from the same carbon nucleus—the four orbitals point toward the corners of a regular tetrahedron
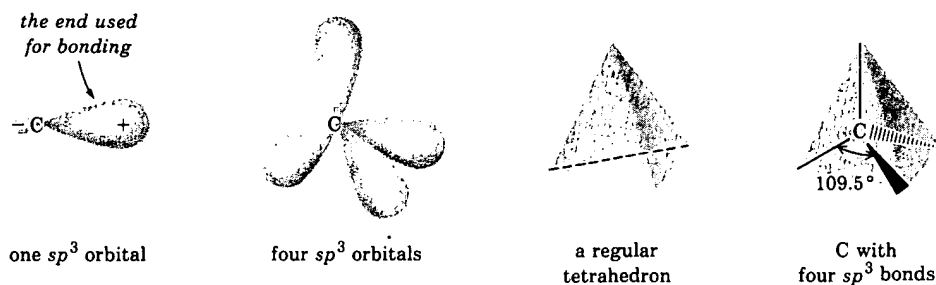
the end used
for bonding

one sp^3 orbital   four sp^3 orbitals   a regular   C with
                                                    tetrahedron   four sp^3 bonds

109.5°

Figure 2.8 The four sp^3-hybrid orbitals of carbon point toward the corners of a regular tetrahedron.

(Figure 2.8). This geometry gives idealized bond angles of 109.5°. An sp^3-hybridized carbon atom is often referred to as a **tetrahedral carbon atom** because of the geometry of its bonds.

When an sp^3-hybridized carbon atom forms bonds, it does so by overlapping each of its four sp^3 orbitals (each with one electron) with orbitals from four other atoms (each orbital in turn containing one electron). In methane (Figures 2.9 and 2.10), each sp^3 orbital of carbon overlaps with a $1s$ orbital of hydrogen. Each of the resultant sp^3-s molecular orbitals is symmetrical around the axis passing through the nuclei of the carbon and the hydrogen. The covalent bonds between C and H in methane, like the H—H covalent bond, are sigma bonds.
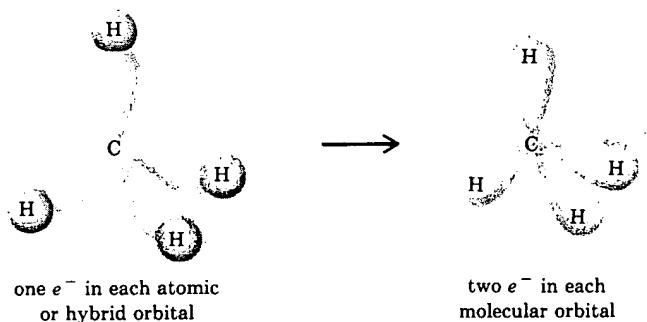
one e^- in each atomic   two e^- in each
or hybrid orbital   molecular orbital

Figure 2.9 Formation of C—H sigma bonds in methane, CH_4. (The small lobes of the sp^3 orbitals are not shown.)

CH_4

condensed   complete   dimensional   molecular
structural formula   structural formula   formula   model

Figure 2.10 Some different ways of representing methane.

ethane

Figure 2.11   Formation of the sp^3-sp^3 sigma bond in ethane, CH_3CH_3.

| condensed structural formula | complete structural formula | three-dimensional formula | molecular model |

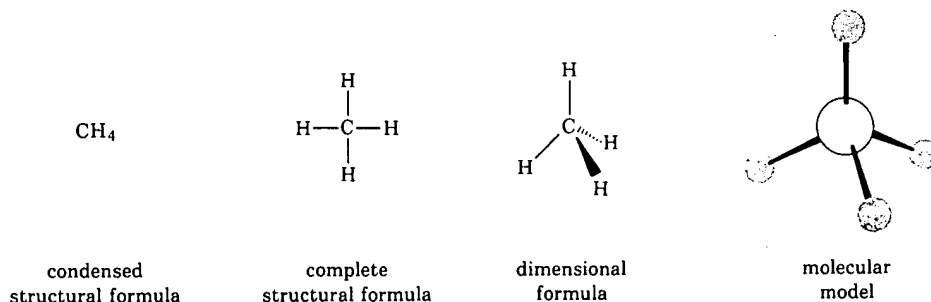**Figure 2.12**   Some different ways of representing ethane.
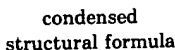
Ethane (CH_3CH_3) contains two sp^3-hybridized carbon atoms. These two carbon atoms form a C—C sigma bond by the overlap of one sp^3 orbital from each carbon (sp^3-sp^3 sigma bond). Each carbon atom has three remaining sp^3 orbitals, and each of these overlaps with a 1s orbital of a hydrogen atom to form a C—H sigma bond. Each carbon atom in ethane is tetrahedral (see Figures 2.11 and 2.12).
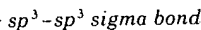
In any molecule, any carbon atom bonded to four other atoms is in the sp^3-hybrid state, and the four bonds from that carbon are sigma bonds. When carbon is bonded to four other atoms, the sp^3 hybridization allows maximal overlap and places the four attached atoms at the maximum distances from each other. If possible, the sp^3 bond angles are 109.5°. However, other factors, such as dipole—dipole repulsions or the geometry of a cyclic compound, can cause deviations from this ideal bond angle.